

## PRACTICE PROBLEMS

1. A pitcher throws a baseball at a speed of 90.0 mi/h towards home plate, which is located 60.0 ft away. How far has the ball dropped when it reaches the plate? Assume the ball leaves the pitcher's hand traveling horizontally.
  - (a) The horizontal distance.
  - (b) The time of flight.
2. An arrow is shot at an initial velocity of 25.0 m/s at an angle of 30.0 degrees with respect to the horizontal.
  - (a) What is the maximum height reached by the arrow? (b) How far does the arrow travel in the horizontal direction in returning to the same level from which it was shot?
3. A plane is traveling at a velocity of  $2.0 \times 10^2$  m/s at an angle of 45 degrees below the horizontal. It releases a bomb at an altitude of  $1.0 \times 10^3$  m, which strikes a target on the ground.
  - (a) How far was the plane from the target when the bomb was released? (b) How long did it take the bomb to strike the target after being released? (c) What was the bomb's speed at the moment of impact?
4. A diver springs upward from a three-meter board. At the instant she contacts the water her speed is 8.90 m/s and her body makes an angle of  $75.0^\circ$  with respect to the surface of the water.
  - (a) Determine her initial velocity, both magnitude and direction. (b) How much time does she spend in the air?
5. A ball rolls off the top of a stairway with a horizontal velocity of 2.0 m/s. The steps are each 20.0 cm high and 20.0 cm wide. Which step will the ball hit first?

6. When a cannon is aimed at an angle of  $45^\circ$  above the horizontal, a cannon ball lands  $1.0 \times 10^2$  m down range. What was the muzzle velocity of the cannon ball?

7. The compass of an aircraft indicates it is headed due north, and its airspeed indicator shows that it is moving through the air at 120 mi/h. If a wind of 50.0 mi/h blowing from west to east suddenly arises, what is the velocity of the aircraft relative to the earth?

8. An airplane pilot wishes to fly due south. A wind of 25 km/h is blowing toward the west. If the flying speed of the plane is 300.0 km/h (its speed in still air), in what direction should the pilot head?

9. Two trains approach a railroad station, one from the north at 30.0 m/s, the other from the east at 40.0 m/s. Find the velocities of (a) the railroad station and (b) the south-bound train, relative to the west-bound train.

10. A boat can travel at a speed of 20.0 km/h relative to the water. The boat sails across a river (perpendicular to the river bank) and reaches a point 5.00 km directly across from its launch point. The water is flowing at a speed of 8.00 km/h parallel to the river bank. (a) At what angle must the boat steer to reach its destination? (b) How much time is required for the boat to make the trip?